DOCUMENT RESUME

ED 243 902 TM 830 744

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TITLE Interpreting Mathematics Scores on the New Jersey College Basic Skills Placement Test.
INSTITUTION Educational Testing Service, Princeton, N.J.; New Jersey Basic Skills Council, Trenton.; New Jersey State Board of Higher Education, Trenton.
PUB DATE 81
NOTE 15p.; Contains small print.
PUB TYPE Guides - Non-Classroom Use (055) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Algebra; Basic Skills; *College Freshmen; Computation; Higher Education; Mathematics Achievement; *Quantitative Tests; Scores; *Student Placement; *Test Interpretation; Test Reliability; Test Validity
IDENTIFIERS *New Jersey College Basic Skills Placement Test

ABSTRACT

The New Jersey College Basic Skills Placement Test (NJCBSPT) is designed to measure certain basic language and mathematics skills of students entering New Jersey colleges. The primary purpose of the two mathematics sections is to determine whether students are prepared to begin certain college-level work without a handicap in computation or elementary algebra. This guide discusses the scale used for reporting scores on the NJCBSPT; test score distributions; the reliability of the test and its standard error of measurement; its content validity, concurrent validity, and placement validity; and item-test regression research. General guidelines for assessing proficiency with each subtest are provided. Selected references on using placement test scores, and four sample score reports are appended. (BW)

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Interpreting Mathematics Scores on the New Jersey College Basic Skills Placement Test

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THE NATURE AND PURPOSE OF THE TEST

The New Jersey College Basic Skills Placement Test* (NJCBSPT) is designed to measure certain basic language and mathematics skills of students entering New Jersey colleges. The primary purpose of the two mathematics sections (Computation and Elementary Algebra) is to determine whether students are prepared to begin certain college-level work without a handicap in computation or elementary algebra. Each of these sections consists of 30 multiple-choice questions to be answered in 35 minutes. Each is scored as the number of correct answers a student gave (i.e., there is no correction for guessing).

The questions contained in the Computation section measure a student's ability to perform basic arithmetic operations and to solve problems that involve fundamental arithmetic concepts. The questions in the Elementary Algebra section measure the ability to perform basic elementary algebra operations and to solve problems that involve elementary algebra concepts. A scaled score and a local percentile rank are reported for each section. The local percentile rank is based on the scores of students at the particular college who took the test the previous year. In addition, the individual score report provides information about the student's responses to every question contained on the two mathematics sections. A plus sign (+) beneath a question number indicates that the question was answered correctly; a zero (0) indicates that the question was omitted; and a letter (A, B, C, or D) indicates the particular incorrect choice the student selected. Sample score reports are shown on pages 13 and 14.

The NJCBSPT is not an admissions test; in fact, it is administered only *after* students have been admitted to the college of their choice. Neither is it an aptitude test designed to predict academic success in college. It does, however, point out the deficiencies in basic skills and concepts that may impede such success. Like any measurement tool, the test is most effective when used for its designed purpose. The section entitled "General Guidelines for Assessing Proficiency" suggests some ways that the mathematics tests may be used for placement.

THE SCALE USED FOR REPORTING SCORES

An understanding of both the scale used for reporting test scores and the distributions of the scores is necessary if NJCBSPT scores are to be properly interpreted and used.

Scores on the NJCBSPT were initially reported on a scale that started at 35 and, in the base year, had a mean of 65 and a standard deviation of 10. Scaled scores in subsequent years were placed on the same scale. In 1980, the scale was raised by 100 points in order to avoid any possible confusion with percentile ranks. Chosen by the New Jersey Basic Skills Council, this scale is not used for reporting scores on any other standardized test.

The following are two significant reasons why scaled scores, rather than raw scores, are reported for the NJCBSPT:

1. The primary reason for using scaled scores rather than raw scores for reporting NJCBSPT results is that the use of scaled scores rather than raw scores minimizes the chances that students' scores will be affected by the particular form of the NJCBSPT they take. Although every attempt will be made to insure that future forms of the NJCBSPT will be equivalent to the first form, inevitably the difficulty levels of those forms will fluctuate slightly. Without scaled scores, comparisons of scores from form to form, or from year to year, are nearly impossible to make. Scaled scores on each new test form are made equivalent to scaled scores on the previous forms by means of a set of questions common to both forms.

2. The second reason for using scaled scores rather than raw scores is that, without a common score reporting scale, it would be difficult to provide meaningful composite scores. Simply summing the raw scores for the various sections in order to obtain a composite score would give more weight, in most cases, to the section with the greatest number of items. Each of the constituent scores in the composite scaled scores for the NJCBSPT is equally weighted. Although two composite scores are reported for the language skills sections, a composite score in mathematics is not considered useful and thus is not reported for the Computation and algebra sections.

TEST SCORE DISTRIBUTIONS

Because the mathematics sections of the NJCBSPT are intended to indicate whether a student can enter certain college classes without a *severe* handicap in computation or elementary algebra, they are constructed to be significantly less difficult than many other standardized mathematics tests.

If students do not know the answer to any of the questions on a difficult test, they achieve a chance score and nothing is learned about the level of their skills. However, if students answer correctly 15 out of 30 questions on an easy test, but demonstrate limited skills, they probably have better skills than students who answered 10 correctly and less highly developed skills than those who answered 20 correctly. Thus, to rank students of limited skills, a measure that allows the students to respond successfully to the questions asked, according to the varying degrees of skills they actually have, should be used.

The approximate distributions of NJCBSPT scores for the Computation and Elementary Algebra sections are depicted in Figures 1 and 2, respectively. These score distributions lack the symmetry of the familiar bell-shaped normal distribution. In Figure 1, scores below the mean of about 165 are considerably spread out while scores above the mean are more closely clustered. Such a distribution allows differences in skills at the lower end to be distinguished. This negatively skewed distribution indicates that the test discriminates better along the lower part of the score scale than in the upper range. This type of distribution is ideal for tests used to identify students in need of remediation. On the Computation section, the raw score mean is typically 67

*For a description of the test, see the publications of the Basic Skills Council, which are described on page 12.

Figure 1. Approximate Distribution for the NJCBSPT Computation Scores

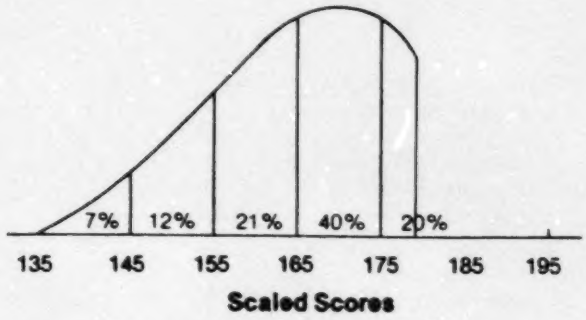
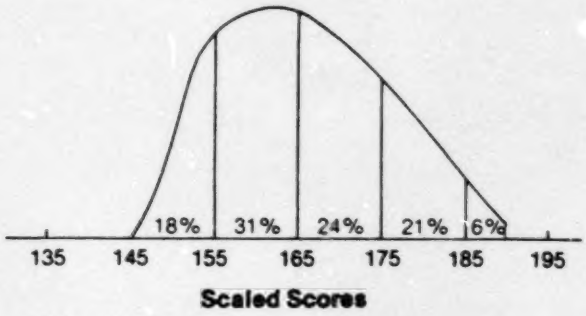


Figure 2. Approximate Distribution for the NJCBSPT Elementary Algebra Scores



percent of the maximum possible score, and scaled scores typically range from 135 to 179.

While the Computation scores fall mostly at the upper end of the distribution, the Elementary Algebra scores tend to fall closer to the lower end of the distribution, as shown in Figure 2. The raw score mean is typically 47 percent of the maximum possible score, and scaled scores typically range from 145 to 188. Although it is more difficult for New Jersey college freshmen than any other section of the Basic Skills Placement Test, in terms of elementary algebra content, it is quite easy. This situation suggests that a large number of students taking the test lack basic algebra skills. On the current Elementary Algebra section of the test, all students with scores below the mean should probably be required to take an elementary algebra course because they lack proficiency in handling the simplest operations and equations.

Several things should be remembered in connection with the Elementary Algebra score distribution. Some of New Jersey's better students go to college out of state. Several New Jersey colleges have open enrollment; many students who have studied little or no algebra apply to these colleges; from 9 to 13 percent of the NJCBSPT population typically do not even take the Elementary Algebra section of the test.

RELIABILITY AND STANDARD ERROR OF MEASUREMENT

The score a student obtains on any given test on any one occasion is only an approximate measure of the student's skills in the areas measured by the test. A student who takes two versions of a test, or who even takes the same test on two different days is unlikely to obtain precisely the same score each time. This variation could be due to changes in the individual over time, or to differences in the sample of questions on the test sections, or to both of these factors in combination with others. The extent to which students' scores on a test may be expected to vary from one occasion to another is expressed by two statistics —the reliability coefficient and the standard error of measurement.

The reliability coefficient, a number that ranges from 0 to 1, can be thought of as the correlation between scores on two parallel or equivalent forms of a test. The Kuder-Richardson Formula 20 (KR-20) estimate of reliability is frequently used in reporting reliabilities. Because it is based on examinee responses to test questions on one occasion, it is generally easier to obtain than parallel-form estimates, which require two administrations of the test to the same group of examinees. Consequently, KR-20 is not a direct measure of the stability of test scores across time. However, for tests of no more than moderate speededness*, KR-20 has been shown to closely approximate other estimates of reliability. The KR-20 formula can be found in *Educational Measurement*, edited by Robert L. Thorndike, or in any other basic textbook on mental measurement. The KR-20 reliability coefficients for the Computation and Elementary Algebra sections of the test are typically in the .90 to .94 range.

Of more practical value than reliability coefficients for individual student score interpretations are standard errors of measurement. In any measurement, including measures of aptitude and achievement, there is a difference between reality and results indicated by the measuring device—between a thermometer reading and the actual temperature, between the correct time and that indicated by a particular clock, between a student's true score and the one indicated by the student's test results. Standard errors of measurement permit the test user to assign "tolerances" of a certain number of score points to any observed score. There are about 2 chances in 3 that a given observed score is within one standard error of a student's true score and about 95 chances in 100 that it lies within two standard errors of the true score.

The scaled score standard error of measurement for the two mathematics sections of the NJCBSPT are typically in the following ranges: Computation, 3.3 to 3.6; Elementary Algebra, 3.1 to 3.2. It is recommended that the imprecision contained in any test score, as represented by the standard error of measurement, be taken into account when students are placed in mathematics courses on the basis of cutoff scores established by a college.

*A test is considered unspeeded if all the examinees complete at least 75 percent of the test and at least 80 percent of the examinees complete the entire test.

VALIDITY

Test validity is the extent to which a test measures what it is intended to measure and the extent to which test results serve the purposes of the test. Thus, the validity of the NJCBSPT should be considered in the light of the evidence that justifies its use as a placement instrument. A variety of evidence was studied as it relates to the following kinds of validity.

Content Validity

A test is said to have content validity if the skills assessed by the test are in fact appropriate to the purpose of the test. The New Jersey Department of Higher Education attempts to ensure the content validity of the NJCBSPT by involving users of the test in every aspect of its development from initial planning to final administration. A test advisory committee consisting of 10 mathematics faculty members, who represent all major types of New Jersey colleges, has responsibility for (1) setting detailed content specifications; (2) writing some and reviewing and approving all questions to be presented; (3) reviewing pretest statistics and selecting the mathematics questions to appear in the final edition of the test; (4) reviewing the final assembled version of the test; and (5) conducting research and recommending policy designed to improve the usefulness of the test. The chairman of the committee is also a member of the New Jersey Basic Skills Council.

The committee members bring their experience as classroom teachers to bear on judgments of the fairness and relevance of each question to the purpose of the test. They judge whether or not the relationship among questions in the test as a whole is satisfactory. Using the available statistical data as a guide, they also judge whether the test is sufficiently similar to previous test forms.

As a further check on the appropriateness of the content specifications, content-validity questionnaires were sent to faculty at *two* 2-year colleges, *two* 4-year colleges, Rutgers/The State University, and New Jersey Institute of Technology. The results of the survey tend to support the appropriateness of the content of the NJCBSPT for its intended purpose of assessing the mathematics preparedness of beginning college students.

Concurrent Validity

One method of validating a new test is to demonstrate that scores on the new test have a high correlation with scores on an already validated test that is intended to measure the same or a similar trait. The relationship between NJCBSPT scores and scores derived from the College Board's Comparative Guidance and Placement (CGP) test were examined to establish the concurrent validity of the NJCBSPT.

In 1978, 822 students at Mercer County Community College took both the NJCBSPT and the CGP tests. The CGP tests are designed to serve purposes similar to those served by the NJCBSPT. The correlations between the analogous mathematics tests in the two batteries were as follows: Computation, $r = .67$ and Elementary Algebra, $r = .72$. The reason for the somewhat lower correlation for the Computation section may be that, even though the two tests are identically named, the NJCBSPT contains a substantial number of arithmetic reasoning problems while the CGP does not. The relatively high correlations between the two batteries of tests suggests that they are measuring similar constructs. The CGP tests have been validated extensively through the CGP Program's own validity study service; the correlations between the already validated CGP tests and the NJCBSPT provide evidence that the latter test is also valid for placement.

Placement Validity

It is important to distinguish between the effectiveness of a placement *test* and the effectiveness of a placement *program*. Although the validation of a placement test must take place in the context of a placement program, the test and the program are not identical. Because the evaluation of the NJCBSPT and the evaluation of the placement program are so interdependent, the New Jersey Basic Skills Council decided to have two studies conducted simultaneously. The first dealt with the placement validity of the test; the second with the evaluation of remedial placement programs that utilize scores from the NJCBSPT. The first study, conducted by Educational Testing Service and supported by the New Jersey Department of Higher Education, focused on instructor satisfaction, student satisfaction, and the relationship between test scores and course grades. A survey showed that the instructors were generally satisfied with the results of student placement (71 percent of the mathematics students were correctly placed with the NJCBSPT). Approximately 310 students responded to a similar survey and, of these, 83 percent judged themselves to have been properly placed and 91 percent judged that their classmates had been properly placed.

The second study for the evaluation of remedial placement programs was conducted by the Bureau of Educational Research and Development in the Graduate School of Education of Rutgers University and its findings are summarized in a report by Smith and Schavio, 1980.* Those interested in a detailed description of how the studies were conducted and more information about the results should request a copy of the report, "Validation of the New Jersey College Basic Skills Placement Test," by Lawrence W. Hecht.*

ITEM-TEST REGRESSION RESEARCH

To successfully teach remedial mathematics classes, the teacher needs maximum skill and maximum information. Although the primary purpose of the NJCBSPT battery is to furnish information to aid proper placement of students, a secondary use of the tests is to provide diagnostic information, i.e., information about how far the student has progressed in the subject and just which skills that student has or does not have.

If certain skills can be arranged in a hierarchy with mastery of lower-level skills necessary before students progress to higher level skills, then test results based on a large sample may be used to investigate the hierarchy of skills. Such information may be helpful to the teacher who is planning an appropriate instructional sequence for a class in re-

*Requests for reports on either of the two validity studies should be addressed to the Director of the Basic Skills Assessment Program, Department of Higher Education, 225 West State Street, C.N.-542, Trenton, N.J., 08625.

medial mathematics. The following pages describe an analysis of the Computation and Elementary Algebra sections of the NJCBSPT battery. The analysis was made by Dr. Charles Pine, Professor of Physics at Rutgers/Newark and Chairman of the NJCBSPT Mathematics Advisory Committee, using item-test regression curves to investigate the relative difficulty of the skills tested by the Computation and Elementary Algebra sections.

Item-test regression curves are used to relate the probability of success on a particular question to the ability measured by all the questions in the test. These curves provide such information as the probability that a person attaining a given overall score will correctly respond to any specific question, what the difficulty of any question is relative to the other questions on the test, and in which score ranges each question is most discriminating. For a given test, the statistics based on item-test regression curves should not vary greatly from one group of test takers to another. In other words, the shape of the curve for a question on a given test should be characteristic of the question and should ideally not be dependent on the population taking the test. In one study of this hypothesis, a sample (N = 970) of the statewide New Jersey test population, for which the mean raw score on the Elementary Algebra section of the test was 14, was compared with a considerably more able subgroup (N = 767), for which the mean raw score was 20. When the points for a given quest on were plotted for each group, the points generally defined the same curve, regardless of the difference in average ability. Figure 3 shows an example of this for algebra question 48 in Form 3BJP. The circled dots denote the points plotted for the statewide sample, and the x's denote the points plotted for the more able subgroup.

The fact that the shape of the item-test regression curve does not depend on the mean ability of the test population as a whole is not surprising. Remember that the points on the curve represent the percent that responded correctly in *each* successive score group; although the more able population may have many more students in the highest score group, for example, the percent of these students responding correctly is not likely to be very different from the percent of top scorers drawn from the less able population. In other words, although the frequency distributions of test scores for two populations may be very different, the corresponding score groups within each of the two populations are likely to be homogeneous in terms of the probability of success on any specific question. Of course, if a population were so able that few, if any, cases were in the low score groups, the curves representing that population would not extend over the entire range.

Figures 4-7 illustrate item-test regression curves plotted for a much larger population: the 20,411 students who attempted the Elementary Algebra portion of Form 3BJP through the first three scoring cycles for the academic year 1979-80. In Figure 4 the item-test regression curve for item 48 is shown again. Note the finer resolution attainable with the much larger population.

Figure 3. Item-Test Regression Curve for a Statewide Sample and a More Able Subgroup Who Took the Elementary Algebra Section

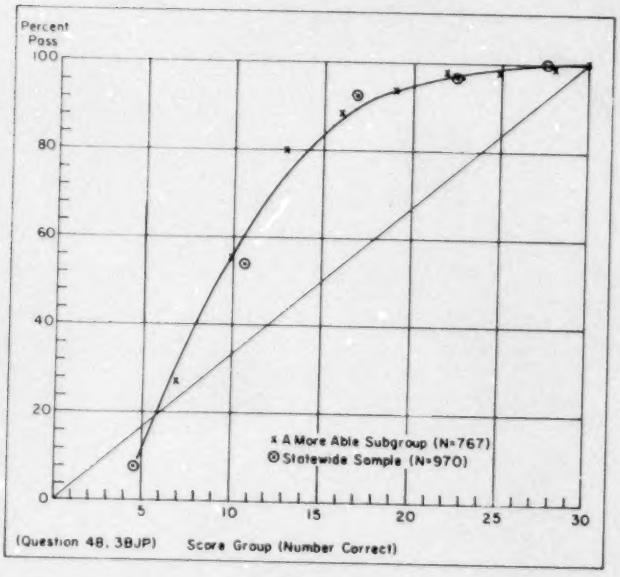
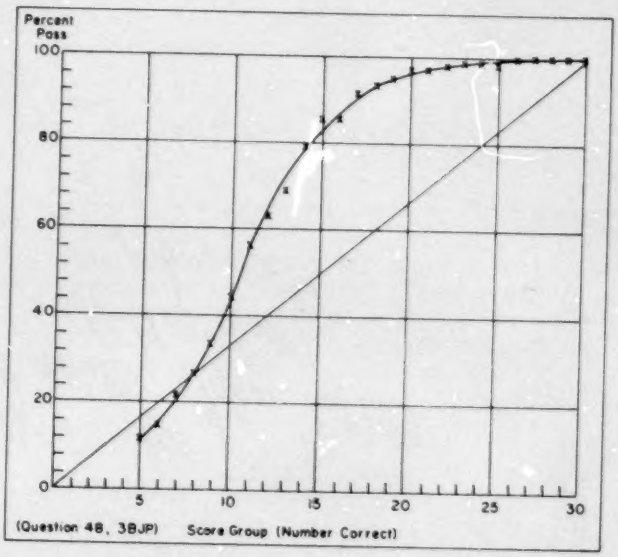


Figure 4. Item-Test Regression Curve for 20,411 Students Who Took the Elementary Algebra Section



The item-test regression curve for question 48* in Figure 4 can be interpreted in the following ways. For a student with a raw score of 5 on the Elementary Algebra section, the probability of a correct response to this question is about 0.12; for a student with a raw score of 17, the probability is about 0.90. Since the probability of obtaining a correct response increases rapidly as raw scores increase from 5 to about 17 and changes relatively little thereafter, the question discriminates well among students who

*Question 48 in Form 3BJP is of the type $(3x + 1)(5x - 1) = ?$

achieve scores less than 17 and discriminates poorly for those who score above 17. This is then the pattern associated with a highly discriminating, rather easy question.

Figure 5 shows the item-test regression curve for 39*, a harder question which discriminates uniformly over the entire range of abilities.

Figure 5. Item-Test Regression Curve for a Moderately Difficult Question on the Elementary Algebra Section

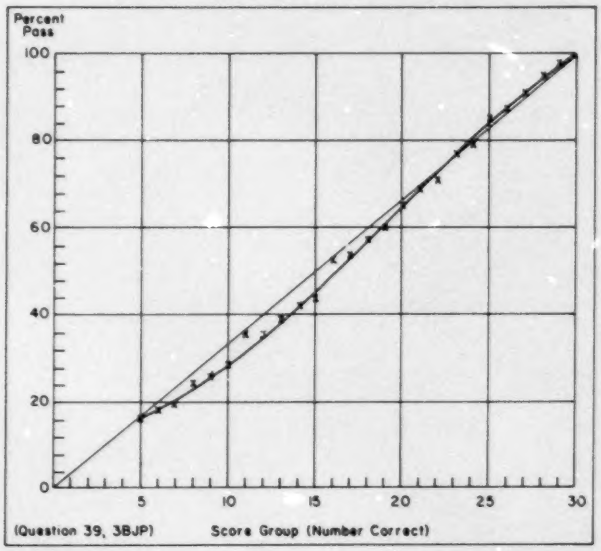


Figure 6 shows the curve for 40**, a difficult question which discriminates well among students at the upper end of the ability scale but does not discriminate for lower ability students.

Not only do the item-test regression curves give valuable information about the discriminating power of the items in various score ranges, but they also graphically illustrate guessing patterns. Figure 7 shows the item-test regression curve for question 60*** in Form 3BJP. Notice that for the students with raw scores less than 26 on the Elementary Algebra section, the probability of a correct response is around the chance level. It is likely that many students below the high ability level resorted to guessing.

In investigating the possible hierarchy of skills measured by the Computation and Elementary Algebra sections in the NJCBSPT, the item-test regression curves were used to determine the lowest section score for which there was an 80 percent probability of success on each question. These minimum scores were used to establish the relative difficulty of the questions, which were then ordered from easiest to most difficult as in Tables 1 and 2, which refer to Form 3BJP. The item-test regression curves used were plotted

*Question 39 in Form 3BJP is of the type $\frac{b^4}{b^4} = ?$

**Question 40 in Form 3BJP is of the type $\frac{b}{b + b^2} = ?$

***Question 60 in Form 3BJP is of the type $px = b - x; x = ?$

Figure 6. Item-Test Regression Curve for a Difficult Question on the Elementary Algebra Section

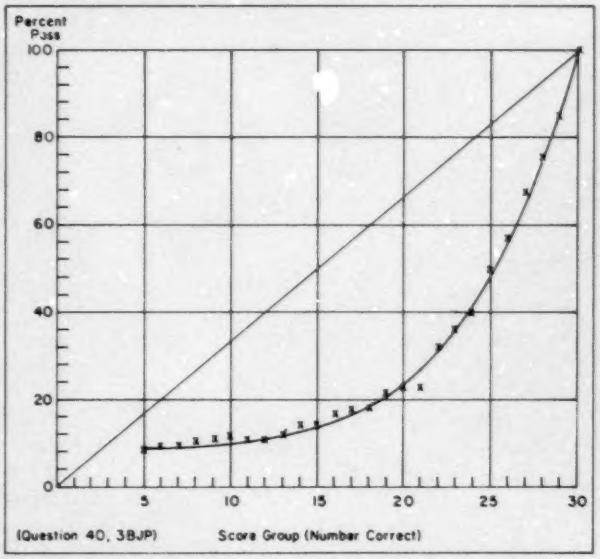
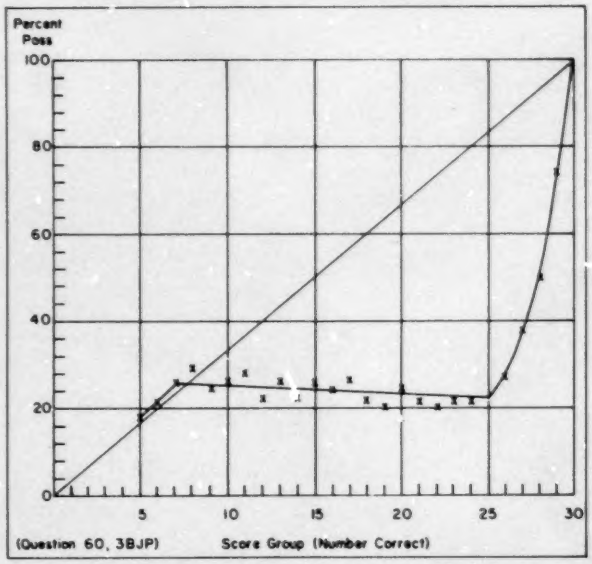


Figure 7. Item-Test Regression Curve for a Very Difficult Question on the Elementary Algebra Section



from the data for the first three scoring cycles for 1979-80; the population consisted of the 20,411 students who attempted the Elementary Algebra section and the 21,808 students who attempted the Computation section. However, because the average percent correct for any question is a sample-dependent statistic, the values given for these statistics in Tables 1 and 2 are taken from spaced, random, statewide samples for the entire population tested in 1979-80. Specifically, a statewide sample of 2,810 students

was used for the Elementary Algebra section and a statewide sample of 3,150 students was used for the Computation section. (The average percent correct for each question would be somewhat higher for the students tested in the first three cycles; the more able students tend to test earlier.)

Table 1. Relative Difficulty of Questions on the Elementary Algebra Section, Form 3BJP

Minimum Raw Score for 80% Chance of Correct Response	Question Number	Percent Correct	Question Number	Percent Correct	Question Number	Percent Correct	Scaled Score	Cumulative Frequency*
9	41	82					58	1
10-13	--	--					(60-64)	1
14	31	67					65	2
15	48	62	35	63			67	4
16	46	65					68	5
17	--						(70)	5
18	47	59					71	6
19	36	52	51	59			73	8
20	49	56	33	51			74	10
21	52	48					75	11
22	37	49	38	52			77	13
23	59	46	50	45	45	58		
					54	48	78	17
24	34	44	39	45	55	48	80	20
25	42	45	32	45	53	47	81	23
26	44	36	56	33			83	25
27	43	32	58	28			84	27
28	57	36					85	28
29	40	24					87	29
30	60	31					88	30

*Number of questions mastered by each score level
N = a statewide sample of 2,810 students

Table 2. Relative Difficulty of Questions on the Computation Section, Form 3BJP

Minimum Raw Score for 80% Chance of Correct Response	Question Number	Percent Correct	Question Number	Percent Correct	Question Number	Percent Correct	Scaled Score	Cumulative Frequency*
12	2	88					52	1
12-16	--	--					(53-58)	1
17	15	80	17	83	19	80	59	4
18	5	80					61	5
19	8	72					62	6
20	7	70	18	77			64	8
21	6	68	9	71			65	10
22	3	73	20	71	26	74	67	13
23	12	66	13	65	14	72	69	16
24	11	66					70	17
25	21	65	22	62	24	56		
					27	66		
					28	67	72	22
26	4	71	16	61	23	52	73	25
27	10	49					75	26
28	1	54	25	50	29	51	76	29
29	30	45					78	30

*Number of questions mastered by each score level
N = a statewide sample of 3,150 students

Notice from Table 1 that the easiest question on the Elementary Algebra section was question 41, which was answered correctly by 82 percent of the total sample and by 80 percent of those with a raw score as low as 9. A student had to have a raw score of 19 to have 80 percent probability of getting questions 36 and 51 correct, and no score group with less than a perfect score had an 80 percent probability of getting question 60 correct. The 80 percent level was arbitrarily chosen. Had the level chosen been 90 percent instead, the questions ordered from easiest to most difficult would have been approximately the same with no question moving more than one position out of order with respect to the other questions. Of course, most of the minimum scores corresponding to the 90 percent level would be two or three points higher than they are for the 80 percent level.

Tables 1 and 2 show the relative difficulty of the test questions. With the tables and a test booklet for Form 3BJP, it is possible to investigate the hierarchical nature of the skills being measured by the tests. For example, on Form 3BJP, consider questions 33, 46, 47, 54, 55, 56, and 60, all of which test the ability to solve equations and inequalities. Table 3 below shows equations of the same types listed in the order of increasing difficulty, where the ordering is determined by the lowest scores at which one can expect 80 percent correct responses.

Table 3. Lowest Scores at Which There Is 80 Percent Correct Response for Certain Types of Elementary Algebra Equations

Question No.	Type of Equation	Lowest Score at Which There Is 80 Percent Correct Response
46	$7y - 4 = 1$	16
47	$4x = 7 - 2x$	18
33	$9x - 4 = 13 + 3x$	20
54	$3x - 4 > x + 3$	23
55	$bx + c = 5$	24
56	$\frac{x-1}{4} = \frac{2x+1}{3}$	26
60	$px = b - x$	30

Note the similarities and differences in the three pairs of marked equations. Questions 46 and 55 and 47 and 60 are structurally the same; in each pair, the two equations require the same number and order of operations. The only difference is that in the more difficult equation, numerical coefficients and constants are replaced by literal ones. Now note the difference in the raw scores at which 80 percent correct response to each equation occurred. One can infer that a large number of students who have the ability to solve equations that involve familiar numbers cannot perform the same operations when the more abstract literal coefficients and constants are involved. Now compare the performance on questions 33 and 54. The increased difficulty of question 54 may be due to its being an inequality rather than an equation, but it is probably also due to the fact that many students do not understand that on the right side of the equation, the coefficient of x is one and not zero.

Such information should have implications for teachers, not only in understanding the level of abstraction at which students with certain scores can probably operate when they enter a course, but also in knowing the approach that should be used to teach the concepts involved.

A number of examples similar to questions on the Elementary Algebra section have been presented. So that those who do not have ready access to Form 3BJP may get a sense of the content of the Computation section also, some examples are given in Table 4. The questions given cover a range through the Computation hierarchy with question numbers corresponding to those of similar questions in Form 3BJP.

Table 4. Examples of Questions in the Computation Section, Form 3BJP

Question No.	Questions
19	8.35×4.7
7	$\frac{3}{8} - \frac{1}{12} =$
9	$\frac{7}{9} - \frac{4}{5} = ?$
26	If 6 pounds of cheese cost $8.04, how much will 4 pounds cost?
12	$7\frac{1}{8} - 3\frac{1}{16}$
27	35 percent of 180 = ?
16	Express $\frac{9}{20}$ in decimal form.
23	$0.6\overline{)360}$
10	$\frac{8}{\frac{1}{4}} = ?$
30	20 is 8 percent of what number?

Another way to look at the relative difficulties of the questions in the Computation and Elementary Algebra sections is given in Tables 5 and 6. Again, the questions are ordered in increasing difficulty according to the lowest score at which one could expect 80 percent of the students at that score level to respond correctly. The range of raw scores is given across the top of each table, and these should be thought of as 24 mutually exclusive score groups in Table 5 and 26 in Table 6. The table shows roughly what percent (the decile) of the students with each raw score responded correctly to each question. For example, question 17, listed in Table 5 and answered correctly by 83 percent of the total sample, was answered correctly by between 50 and 60 percent (6th decile) of the students with a raw score of 9 or 10 and by between 90 and 100 percent (10th decile) of the students with a raw score of 21 or better.

A question answered by more than 80 percent of the students in a particular score group (deciles 9 and 10) might be considered easy for that score group, whereas a question answered correctly by fewer than 50 percent of the students (deciles 1 through 5) could be considered hard for the group. The heavy vertical segments in Tables 5 and 6 show at a glance which questions are easy, moderately difficult, and very difficult for the students in each raw score group. For example, question 52 is difficult for students with raw scores less than 15, is moderately difficult for students with scores ranging from 15 to 20, and is easy for students with scores above 20.

GENERAL GUIDELINES FOR ASSESSING PROFICIENCY

Computation

A scaled score of 164 or below indicates that the student has great difficulty with certain operations, most likely with verbal reasoning problems and problems involving percentages. Declining scores indicate progressively greater difficulty with operations that involve fractions and decimals.

A scaled score between 164 and 172 indicates questionable proficiency, again most likely with respect to percentages and verbal reasoning problems.

A scaled score of 173 or above usually indicates proficiency in the elementary computation skills measured by this section.

Elementary Algebra

A scaled score of 165 or below indicates that the student probably has little or no understanding of the principles of elementary algebra and cannot consistently perform sequences of simple operations. The student should probably take a beginning course in elementary algebra.

A scaled score between 165 and 181 indicates that the student has some misconceptions and probably lacks facility in handling sequences of operations. Such a student is likely to solve easy equations by substituting the possible roots into the equation, but has no systematic approach or lacks the understanding necessary to solve similar equations that involve literal rather than numerical coefficients and roots. The type of instruction the student needs should be determined by careful examination of the pattern of question responses given on the score report.

A scaled score above 181 indicates that the student is proficient in the elementary algebra skills measured by this section. The section is not sufficiently difficult to determine whether the student is able to complete a complex succession of simple operations. A more difficult test could be administered to determine proper placement beyond intermediate algebra.

In the statements above, the topics designated as difficult for students in the various score ranges are based on an analysis of the two matrices (see Tables 5 and 6) that show which questions were difficult for students in each score group and on an analysis of item statistics and response patterns. The statements are intended to provide general information about scores for the entire State of New Jersey. The particular use of this information must be the prerogative of each institution.

Because mathematics prerequisites and mathematics course offerings vary greatly from college to college and

Table 5. Approximate Percent (Decile) of Students with Each Raw Score Who Responded Correctly to Each Question in the Computation Section, Form 3BJP

Question Number	% Pass	Decile for Each Raw Score Group																						
		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2	88	7	8	8	8	8	9	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10
17	83	5	5	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10
15	80	4	5	5	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	10	10	10	10
19	80	4	5	5	6	7	7	7	8	8	8	9	9	9	9	9	9	10	10	10	10	10	10	10	10
5	80	5	5	6	6	7	7	8	8	8	8	8	9	9	9	9	9	9	9	10	10	10	10	10	10
8	72	2	2	3	3	3	4	4	5	6	7	7	8	9	9	9	10	10	10	10	10	10	10	10	10
18	77	4	4	5	5	6	6	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	10
7	70	2	2	2	3	3	4	4	5	6	7	7	8	8	9	9	9	10	10	10	10	10	10	10	10
9	71	3	3	3	4	4	5	5	6	6	7	7	8	8	8	9	9	9	9	10	10	10	10	10	10
6	68	2	2	2	3	3	3	4	5	5	6	7	7	8	8	9	9	9	10	10	10	10	10	10	10
3	73	4	4	4	5	5	5	6	6	7	7	7	7	8	8	8	9	9	9	10	10	10	10	10	10
26	74	3	3	4	4	5	5	6	6	6	6	7	8	8	8	8	9	9	9	10	10	10	10	10	10
20	71	3	3	3	4	4	5	5	5	6	6	7	7	7	8	8	9	9	9	9	10	10	10	10	10
14	72	4	4	4	5	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10
13	65	2	2	2	2	3	3	4	4	5	5	6	7	7	7	8	8	9	9	9	10	10	10	10	10
12	66	2	2	2	3	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	10	10	10
11	66	2	2	3	3	3	4	4	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	10	10
21	65	3	3	3	4	4	4	4	5	5	5	5	6	6	7	7	7	8	8	9	9	10	10	10	10
28	67	3	3	4	4	4	4	5	5	5	5	5	6	6	6	7	7	8	8	9	9	9	10	10	10
27	66	3	3	3	3	4	4	5	5	5	5	6	6	6	7	7	7	8	8	9	9	9	10	10	10
22	62	2	3	3	3	4	4	4	5	5	5	5	6	6	6	7	7	8	8	9	9	10	10	10	10
24	56	1	1	2	2	2	2	3	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10	10	10
4	71	5	5	5	6	6	6	6	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	10
16	61	3	3	3	3	4	4	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10
23	52	1	1	1	1	1	2	2	2	3	3	4	4	5	5	6	6	7	8	8	9	9	10	10	10
10	49	2	2	2	2	2	2	2	3	3	3	3	4	4	4	5	5	6	6	7	8	9	10	10	10
1	54	2	2	2	3	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	9	10	10
25	50	2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	6	6	7	8	9	10	10
29	51	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	6	6	7	8	9	10	10
30	45	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	5	5	6	7	7	8	9	10

Code: Deciles 1-3 (0-30%) - very hard; 4-5 (30-50%) - hard; 6-8 (50-80%) - intermediate; 9 (80-90%) - easy; 10 (90-100%) - very easy

Table 6. Approximate Percent (Decile) of Students with Each Raw Score Who Responded Correctly to Each Question in the Elementary Algebra Section, Form 3BJP

Question Number	% Pass	Decile for Each Raw Score Group																							
		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
41	82	6	7	8	8	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
31	67	4	4	5	6	6	7	7	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10
35	63	3	3	4	4	5	6	7	7	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10
48	62	2	2	3	3	4	5	6	7	8	8	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10
46	65	3	4	4	4	5	5	6	7	7	8	8	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10
47	59	3	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	10	10	10	10	10	10	10	10
51	59	2	3	3	4	4	5	5	6	6	7	7	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10
36	52	2	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	9	9	10	10	10	10	10	10	10	10
49	56	2	2	3	3	4	4	5	5	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	10	10
33	51	2	3	3	3	4	4	4	5	5	6	6	7	7	8	8	9	9	9	9	10	10	10	10	10	10	10
52	48	1	1	2	2	2	3	3	4	4	5	6	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10
38	52	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	10	10	10	10
37	49	2	2	2	3	3	3	3	4	4	5	5	6	7	7	8	8	8	9	9	9	10	10	10	10	10	10
54	48	2	2	3	3	3	3	4	4	4	5	5	5	6	6	7	7	8	8	9	9	9	10	10	10	10	10
59	46	1	1	2	2	2	2	3	3	3	3	4	4	5	6	6	7	8	8	9	9	9	10	10	10	10	10
50	45	2	2	2	3	3	3	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	10	10	10
45	58	4	4	5	5	5	6	6	6	6	6	6	7	7	8	8	8	8	9	9	9	9	10	10	10	10	10
55	48	2	3	3	3	4	4	4	4	4	4	4	4	5	5	6	6	7	7	8	9	9	9	10	10	10	10
39	45	2	2	3	3	3	3	4	4	4	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	10	10
34	44	2	2	2	3	3	3	3	4	4	4	5	5	5	5	6	6	7	7	8	8	9	9	9	10	10	10
53	47	2	2	3	3	4	4	4	5	5	5	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	10
32	45	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	8	8	8	9	9	9	10	10	10
42	45	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10
44	36	2	2	2	2	2	2	2	2	2	3	3	3	3	4	4	5	5	6	7	7	8	9	10	10	10	10
56	33	1	2	2	2	2	2	2	2	2	2	3	3	3	3	4	4	5	5	6	7	8	9	9	10	10	10
43	32	1	1	1	1	2	2	2	2	3	3	3	4	4	5	5	6	6	7	8	8	8	9	9	10	10	10
58	28	1	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	4	4	5	6	7	8	9	10	10	10
57	36	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	5	5	6	7	8	8	9	10	10
40	24	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	4	4	5	5	6	7	8	9	10
60	31	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	6	8	10

Code: Deciles 1-3 (0-30%)- very hard; 4-5 (30-50%) - hard; 6-8 (50-80%) - intermediate; 9 (80-90%) - easy; 10 (90-100%) - very easy

from program to program within each college, no single cut-off score can be established as the score below which a student must have special help in mathematics. The mathematics faculty at each institution should not only familiarize themselves with the contents of each test so that test scores can be properly evaluated, but they should also consider any other available indicators of the students' proficiency in mathematics before determining their placement into remedial courses. Ultimately, placement must be made in the context of each student's curriculum requirements, the variety of remedial courses available, and the academic standards of the college.

SELECTED REFERENCES ON USING PLACEMENT TEST SCORES

Developing appropriate placement standards and implementing a placement program is a complex process. It is beyond the scope of this guide to give a full treatment of the extensive subject of college placement. The following references, however, will provide an overview.

Warren Willingham, *College Placement and Exemption.*
New York: College Entrance Examination Board, 1974.
This book develops a framework for dealing with the most important aspects of placement. It discusses a number of closely related placement models, describes the rationale and technical characteristics of the models, and reviews the relevant literature.

Lawrence M. Aleamoni, with contributions by Joseph W. Dougherty, *Methods of Implementing College Placement and Exemption Programs.*
New York: College Entrance Examination Board, 1979.
This book presents the more practical aspects of developing and implementing college placement programs. It is a natural supplement to Willingham's work listed above.

Guide to the Use of the Descriptive Tests of Mathematics Skills.
New York: College Entrance Examination Board, 1979.
This interpretive guide provides a good discussion of how test scores can be used for placement in remedial and regular college courses. It may be especially helpful to users of NJCBSPT scores, because the content and purpose of many of the Descriptive Tests of Mathematics Skills are quite similar to the content and purpose of the NJCBSPT.

Michael J. Zieky and Samuel A. Livingston, *Manual for Setting Standards on the Basic Skills Assessment Tests.*
Princeton, N.J.: Educational Testing Service, 1977.
This guide describes in detail some methods for setting standards based on expert judgment of test content and item difficulty. It includes sample worksheets necessary for using these standard-setting methods.

Interpreting Scores on the New Jersey College Basic Skills Placement Test.
Princeton, NJ: Educational Testing Service, 1980.
This booklet explains in detail how to interpret NJCBSPT scores. It may be of particular interest to those responsible for the placement of students in remedial and regular college English and mathematics courses. The booklet provides score distributions on the various sections of the test and four sample score reports and their appropriate interpretations.

Scoring the Essays (New Jersey College Basic Skills Placement Test).
Princeton, N.J.: Educational Testing Service, 1980.
This booklet describes in detail the procedure for selecting an appropriate essay topic for the NJCBSPT and the subsequent scoring of students' essays. It discusses the holistic scoring method, presents sample essays from each point on the six-point scoring scale, and explains each of the scores on the sample essays.

1981 New Jersey College Basic Skills Placement Test Information Bulletin.
Princeton, N.J.: Educational Testing Service, 1981.
This folder provides students with general information about the NJCBSPT, including its purpose, when and where it is administered, and who is required to take it. It describes the test and its six sections and includes sample questions for each of the sections. It also provides answers to the most frequently asked questions about the NJCBSPT.

SAMPLE SCORE REPORTS

Sample score reports are shown on the next pages. Each score report is followed by a brief interpretation of how the mathematics scores obtained might be used to place the student in the appropriate mathematics course.

NAME Last	First	M.I.	SEX	SOCIAL SECURITY NUMBER	DATE OF BIRTH Mo.	Day	Yr.	COLLEGE CODE	REPORT DATE CYCLE	YR	COLLEGE NAME
									CY		

TEST SCORES AND GROUP PERCENTILE RANKS

English Multiple-Choice Sections			Essay (0-12)	*Composition Score	**Total English Score	Mathematics Sections		LOCAL USE
Reading Comprehension	Sentence Structure	Logical Relationships				Computation	Elem. Algebra	
169/64	140/06	169/63	6/NA	154/27	157/33	179/98	178/94	

CLUSTER SCORES FOR ENGLISH SECTIONS

Reading Comprehension	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Understanding Main Ideas	10	03	14
Understanding Direct Statements	11	00	11
Drawing Inferences	12	02	15
TOTAL SCORE	33	05	40

Sentence Structure	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Using Complete Sentences	00	10	10
Using Coordination & Subordination Appropriately	05	08	13
Placing Modifiers Appropriately	06	06	12
TOTAL SCORE	11	24	35

Logical Relationships	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Categorizing Ideas	11	01	12
Using Appropriate Connectives	12	01	13
Making Analogies	08	03	12
Recognizing Principles of Organization	11	02	13
TOTAL SCORE	42	07	50

New Jersey College Basic Skills Placement Test

INSTITUTIONAL SCORE REPORT

*The Composition score is derived from performance on the Essay, Sentence Structure, and Logical Relationships sections of the test.

**The Total English score is derived from performance on the Essay, Reading Comprehension, Sentence Structure, and Logical Relationships sections of the test.

RESPONSES FOR MATHEMATICS SECTIONS

Question Number	COMPUTATION	ELEMENTARY ALGEBRA
Response	+++++++++++++++++++++++++++++++	+++++++++0++00+B+++0+++++++0+0

A plus sign (+) indicates question was answered correctly. A zero (0) indicates question was omitted. A letter (A, B, C, or D) indicates the letter of the answer selected which was not the correct response.

IN 307427

For mathematics, the student's high school transcript should be reviewed to determine an appropriate mathematics course. A more advanced mathematics test could also be used to indicate an appropriate entry point in the institution's mathematics curriculum.

NAME Last	First	M.I.	SEX	SOCIAL SECURITY NUMBER	DATE OF BIRTH Mo.	Day	Yr.	COLLEGE CODE	REPORT DATE CYCLE	YR	COLLEGE NAME
									CY		

TEST SCORES AND GROUP PERCENTILE RANKS

English Multiple-Choice Sections			Essay (0-12)	*Composition Score	**Total English Score	Mathematics Sections		LOCAL USE
Reading Comprehension	Sentence Structure	Logical Relationships				Computation	Elem. Algebra	
180/99	175/90	176/89	7/NA	173/85	175/90	174/84	154/25	

CLUSTER SCORES FOR ENGLISH SECTIONS

Reading Comprehension	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Understanding Main Ideas	14	00	14
Understanding Direct Statements	11	00	11
Drawing Inferences	15	00	15
TOTAL SCORE	40	00	40

Sentence Structure	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Using Complete Sentences	10	00	10
Using Coordination & Subordination Appropriately	12	01	13
Placing Modifiers Appropriately	09	03	12
TOTAL SCORE	31	04	35

Logical Relationships	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Categorizing Ideas	11	01	12
Using Appropriate Connectives	13	00	13
Making Analogies	10	02	12
Recognizing Principles of Organization	13	00	13
TOTAL SCORE	47	03	50

New Jersey College Basic Skills Placement Test

INSTITUTIONAL SCORE REPORT

*The Composition score is derived from performance on the Essay, Sentence Structure, and Logical Relationships sections of the test.

**The Total English score is derived from performance on the Essay, Reading Comprehension, Sentence Structure, and Logical Relationships sections of the test.

RESPONSES FOR MATHEMATICS SECTIONS

Question Number	COMPUTATION	ELEMENTARY ALGEBRA
Response	+++++++++C+++D++++++++++++++A+	U+UU+UAC+C+UUU+B+UUUUUUUUUUUU

A plus sign (+) indicates question was answered correctly. A zero (0) indicates question was omitted. A letter (A, B, C, or D) indicates the letter of the answer selected which was not the correct response.

IN 307427

The student is proficient in computation but lacks any useful knowledge of algebra. This student needs an elementary algebra course.

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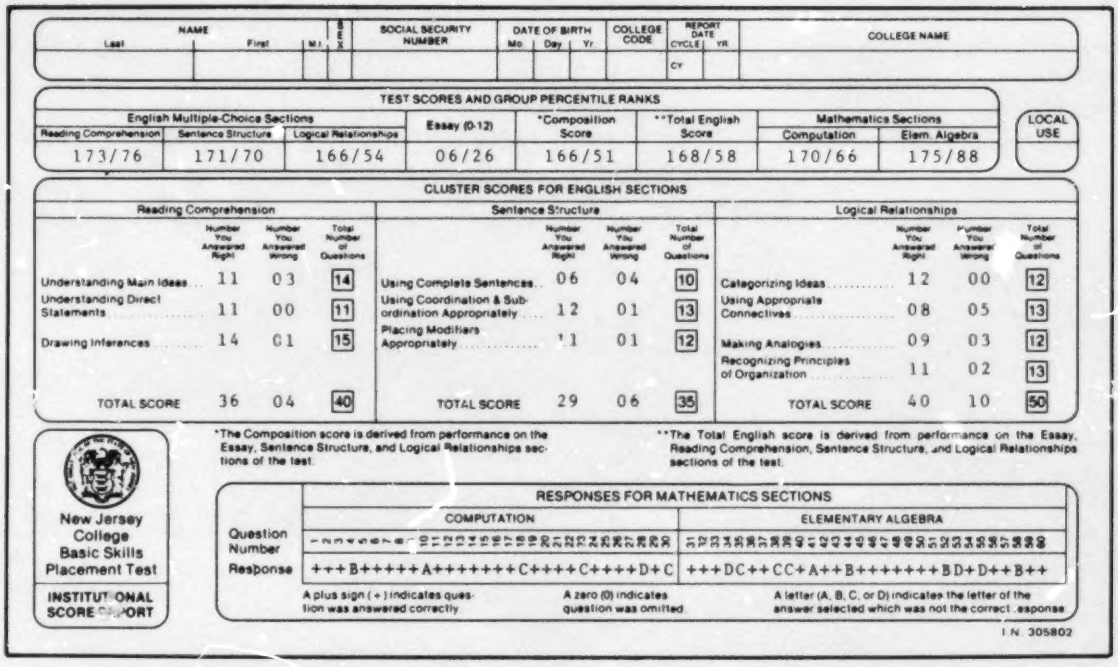


NAME — Last / First / M.I. / SEX | SOCIAL SECURITY NUMBER | DATE OF BIRTH Mo. / Day / Yr. | COLLEGE CODE | REPORT DATE CYCLE / YR | COLLEGE NAME

CY

TEST SCORES AND GROUP PERCENTILE RANKS

English Multiple-Choice Sections			Essay (0-12)	*Composition Score	**Total English Score	Mathematics Sections		LOCAL USE
Reading Comprehension	Sentence Structure	Logical Relationships				Computation	Elem. Algebra	
173/76	171/70	166/54	06/26	166/51	168/58	170/66	175/88	

CLUSTER SCORES FOR ENGLISH SECTIONS

Reading Comprehension	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Understanding Main Ideas	11	03	14
Understanding Direct Statements	11	00	11
Drawing Inferences	14	01	15
TOTAL SCORE	36	04	40

Sentence Structure	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Using Complete Sentences	06	04	10
Using Coordination & Subordination Appropriately	12	01	13
Placing Modifiers Appropriately	11	01	12
TOTAL SCORE	29	06	35

Logical Relationships	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Categorizing Ideas	12	00	12
Using Appropriate Connectives	08	05	13
Making Analogies	09	03	12
Recognizing Principles of Organization	11	02	13
TOTAL SCORE	40	10	50

New Jersey College Basic Skills Placement Test

INSTITUTIONAL SCORE REPORT

*The Composition score is derived from performance on the Essay, Sentence Structure, and Logical Relationships sections of the test.

**The Total English score is derived from performance on the Essay, Reading Comprehension, Sentence Structure, and Logical Relationships sections of the test.

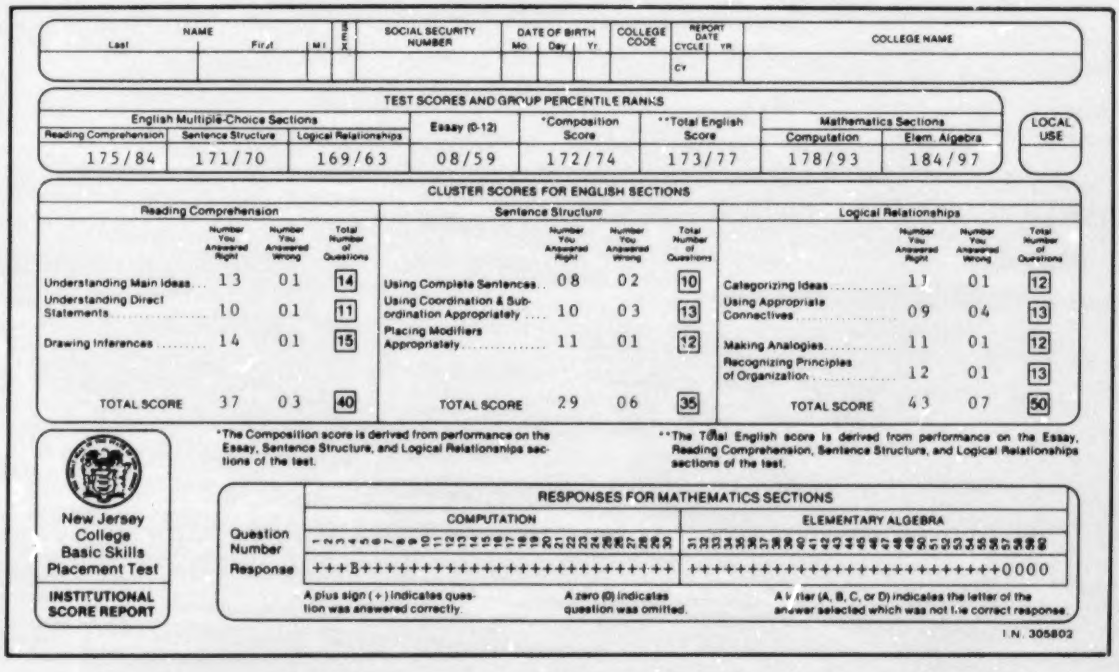
RESPONSES FOR MATHEMATICS SECTIONS

Question Number	COMPUTATION	ELEMENTARY ALGEBRA
Response	+++B+++++A+++++++C++++C++++D+C	+++DC++CC+A++B++++++++BD+D++B++

A plus sign (+) indicates question was answered correctly. A zero (0) indicates question was omitted. A letter (A, B, C, or D) indicates the letter of the answer selected which was not the correct response.

I.N. 305802

The student needs additional work in elementary algebra and in certain aspects of computation.



NAME — Last / First / M.I. / SEX | SOCIAL SECURITY NUMBER | DATE OF BIRTH Mo. / Day / Yr. | COLLEGE CODE | REPORT DATE CYCLE / YR | COLLEGE NAME

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TEST SCORES AND GROUP PERCENTILE RANKS

English Multiple-Choice Sections			Essay (0-12)	*Composition Score	**Total English Score	Mathematics Sections		LOCAL USE
Reading Comprehension	Sentence Structure	Logical Relationships				Computation	Elem. Algebra	
175/84	171/70	169/63	08/59	172/74	173/77	178/93	184/97	

CLUSTER SCORES FOR ENGLISH SECTIONS

Reading Comprehension	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Understanding Main Ideas	13	01	14
Understanding Direct Statements	10	01	11
Drawing Inferences	14	01	15
TOTAL SCORE	37	03	40

Sentence Structure	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Using Complete Sentences	08	02	10
Using Coordination & Subordination Appropriately	10	03	13
Placing Modifiers Appropriately	11	01	12
TOTAL SCORE	29	06	35

Logical Relationships	Number You Answered Right	Number You Answered Wrong	Total Number of Questions
Categorizing Ideas	11	01	12
Using Appropriate Connectives	09	04	13
Making Analogies	11	01	12
Recognizing Principles of Organization	12	01	13
TOTAL SCORE	43	07	50

New Jersey College Basic Skills Placement Test

INSTITUTIONAL SCORE REPORT

*The Composition score is derived from performance on the Essay, Sentence Structure, and Logical Relationships sections of the test.

**The Total English score is derived from performance on the Essay, Reading Comprehension, Sentence Structure, and Logical Relationships sections of the test.

RESPONSES FOR MATHEMATICS SECTIONS

Question Number	COMPUTATION	ELEMENTARY ALGEBRA
Response	+++B++++++++++++++++++++++++++	++++++++++++++++++++++++++++0000

A plus sign (+) indicates question was answered correctly. A zero (0) indicates question was omitted. A letter (A, B, C, or D) indicates the letter of the answer selected which was not the correct response.

I.N. 305802

The student has demonstrated proficiency in computation, but was unable to complete the algebra test, possibly because of time. A more advanced mathematics test should be given to determine whether the student should be placed beyond intermediate algebra.

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